Operating System (Theory-1)

16/1/22

Cls-1

Book:- Operating System Concept - Abraham Silberschatz

Operating System:- An Operating system is the interface between user & the hardware.

→ The goal of OS is to make the machine convenient & efficient.

Functionality of OS:-

→ Memory Management
- Register
- Cache
- RAM
- ROM < HDD, SDD

→ File System (Structual way তে সাজানো)

→ Concurrency (Parallely কাজ করা)

→ Networking (multiple device কে connect & communicate করা)

→ Security & Protection.

OS Management:-

1) Process Management:- 2 types of program:-
① Application Program, ② System Program.

Process:- A Process is one instance of a program in execution.

→ OS must create, delete, suspend, resume scheduled process.

→ Support inter process communication, sychronization & handle deadlock (sort of loop).

18/1/25

OSSP (T-2)
Cls-2

Memory Management:- (Main memory (RAM))

→ OS must keep track of memory in use.
→ OS " " " unused/free memory
→ Direct access for CPU.
→ Process must be in main memory.
→ OS allocate & deallocate space.
→ Context switching (memory switching)

e.s. P1 → 50% execute হয়ে stop হয়ে or store হয়ে PCB তে
P2 → 100% run
P1 → rest of the 50% execute

PCB (Process Control Block) :-

i) Process State:- New, Ready, Running, Waiting, Terminated
ii) Process Number:- Address of the next instruction to be executed.
iii) Register:- Which register will be used.
iv) CPU scheduling:- Information of process priority, scheduling PCB, Queues & other scheduling parameter.
v) Memory Management:- Memory used by the process.

* Job Queue:- All the process enter the system & put in a Job Queue. (1st → Job queue তে এবং RAM হয়ে)
* Ready Queue:- Residing in main memory that are waiting to execute. (Job Q → Ready Q (FIFO) → execute)

Scheduler:-

→ Long term Scheduler:- Selects Processes from this pool & load them into memory for execution. It is also called Job Scheduler.

→ Short term Scheduler:- Selects from among the processes that are ready to execute & allocates CPU to one of them. also called Ready Scheduler/ CPU scheduler.

File System Management:-

File System:- Long term storage entity.

→ File create, delete, rename, copy, read, write.

→ Manipulate directories (Path change → tree ? and)

Disk Management :- (secondary memory) Actual Hardware that underneath the file system. (file system → ~~var~~ more)

→ OS must keep track of used, unused, bad blocks.

→ Disk scheduling.

Protection:- Controlling Access level by Admin (user).

Security:- Defend system against attacks/ threats.

OS (T-3)

24/1/23

→ Operating System কাজ করে DUAL mode.
1. User mode / user view
2. kernal mode / system view

→ core কাজগুলোর kernal mode ↓ code execute হয় (memory management, File management etc)

→ user mode : user এর সাথে interact করে.

User Mode:- [mode bit = 1]

The system is in user mode when the OS is running a user application such as handeling a text editor. The transition from user mode to kernal mode occurs when the application requests the haft of OS & system all occurs. (start করলে kernal হয়ে user mode এ যায়)

→ System call:- User mode (1) এর reg থেকে kernal mode (0).

Kernal Mode:- [mode bit = 0]

The system starts in kernal mode when it boots & after the OS is loaded, it executes application in user mode. There are some privileges instructions that can be only executed in kernal mode. There are interrupt instruction, input, output management etc.

Necessity of DUAL mode:-

* The lack of dual mode in OS can cause serious problems like —

→ A running program can accidentaly wipe out the OS by overwriting it with user data. (যখন user mode এ run করছে user এর data দ্বারা সরাসরি system এর data overwrite করে PC hang করতে etc)

→ Multiple process can write in the same system at the same time, with disastrous result.

System call:- A system call is a mechanism that provides the interface between process & the operating system. It is a programmatic way in which a computer program requests a service from the kernel of the OS.

→ Windows এ 700 টি system call আছে.

Types of System call:-

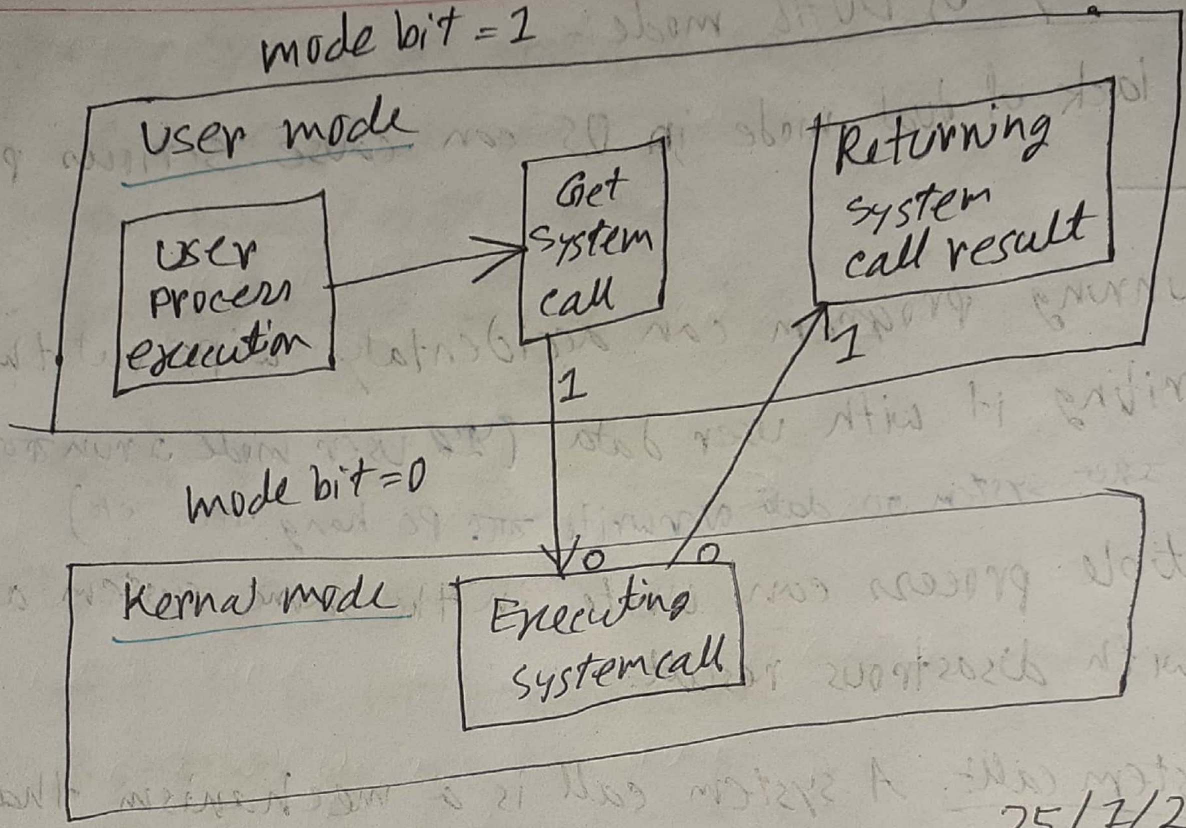
→ Process Control:- Create, load, execute, End, Abort, wait.

→ File Management:- Create, Delete, Open, Copy, Read, Write.

→ Device Management:- Request, Release, Read, Write, Attach, Detach

→ Information Management:- Gets/set time, date etc.

→ Communication:- create/delete connection, send/receive message, attach/detach remote device.



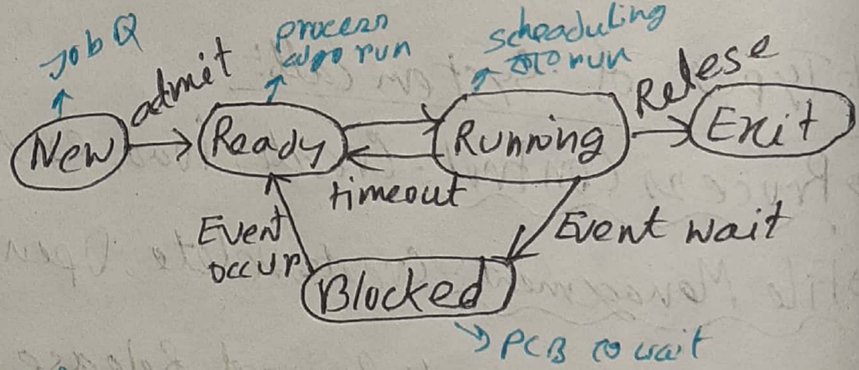
25/1/23

OS(T-4)

Process Scheduling :-

Five State of process Model :-

1) New (Job queue)
2) Ready
3) Running
4) Blocked (wait)
5) Terminate (complete)



* timeout হলে execution শুরু: হলে 0% হয়ে execute হবে ready হবে.

Performance Measurement of process scheduling Algorithm:-

1) Turn Around Time :- (~~[illegible]~~ শেষ হয় 100% execution time)

Completion Time − Arrival Time

2) Waiting Time :- **Turn Around Time − Burst Time**.
↓
Total time in Ready Queue.

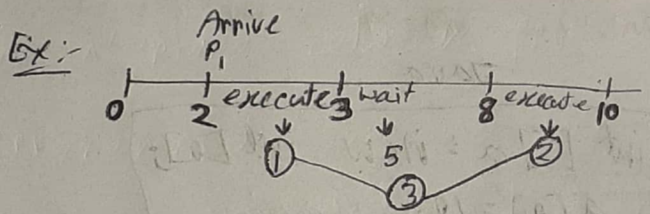
3) Response Time :- Get first Response.

4) Completion Time :- The time when a process fully executed.

5) CPU utilization :- CPU use as much as possible.

6) Throughput :- Number of process completed per unit time.

Ex :-



FCFS Algorithm :- First Come First Serve. It is an Non-Preemptive algorithm. (একটা process run হলে 100% execute হওয়ার পর অন্য process run হবে)

* GANTT chart :-

P_2	P_4	P_3	P_5	P_1

0   4   5   8   13   15

Process	Arrival Time (AT) [illegible] Ready Q-তে আসে	Burst Time (BT) execution time	Response Time (RT) 1st Run time	Completion Time (CT) complete time	Waiting Time (WT)	Turn Around Time (TT)
P_1	4	2	13	15	9	11
P_2	0	4	0	4	0	4
P_3	2	3	5	8	3	6
P_4	1	1	4	5	3	4
P_5	3	5	8	13	5	10

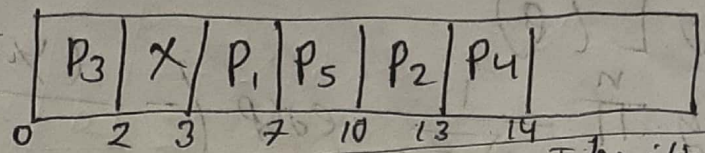
7/2/23

OS (T-5)

FCFS :-

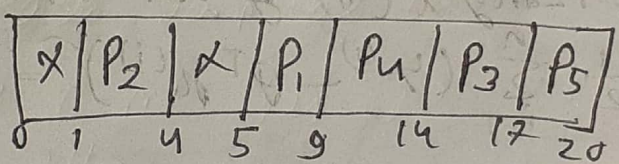
Response Time = 1st Run - Arrival Time

(1) GANTT Chart



Process Id	Arrival T.	Burst T.	Response T.	Completion T	Waiting T	Turn Around T
P_1	3	4	0	7	0	4
P_2	5	3	5	13	5	8
P_3	0	2	0	2	0	2
P_4	5	1	8	14	8	9
P_5	4	3	3	10	3	6
Average —			3.2	9.2	3.2	5.8

(2) GANTT chart



Process Id	A.T	B.T	R.T	C.T	W.T	TAT
P_1	5	4	0	9	0	4
P_4	6	5	3	14	3	8
P_2	1	3	0	4	0	3
P_3	7	3	7	17	7	10
P_5	8	3	9	20	9	12
Avg →			3.8	12.8	3.8	7.4

Assignment –

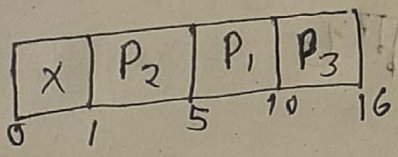
Q. Characteristics of FCFS

OS (T-6)

6/2/23

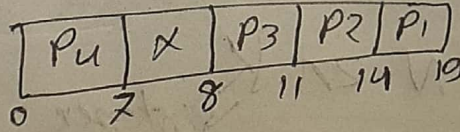
#FCFS

PID	A.T.	B.T.	R.T.	C.T.	W.T.	T.T
P_1	6	5	0	11	0	5
P_2	1	4	0	5	4	10
P_3	7	6	4	17	4	19
Avg:	$\frac{4}{3}$			$\frac{33}{3}$	$\frac{4}{3}$	$\frac{19}{3}$



#SJTF :- (Shortest Job Time First) Non-Preemptive

P.ID	A.T.	B.T.	R.T	C.T.	W.T.	T.T
P_1	10	5	4	19	4	9
P_2	9	3	2	14	2	5
P_3	8	3	0	11	0	3
P_4	0	7	0	7	0	7
Avg:			$\frac{6}{4}$	$\frac{51}{4}$	$\frac{6}{4}$	$\frac{24}{4}$



→ A.T. তে যে P থাকবে সেটা B.T. কম যে আগে execute হবে।

Assignment :

Q. Characteristics of SJTF.

OS (T-2)

8/2/23

SJTF (Non-P.)

P4	P5	P2	P1	P3
0	8	9	11	16	22

PID	A.T	B.T	R.T	C.T	W.T	T.T
P_1	2	5	9	16	9	14
P_2	1	2	8	11	8	10
P_3	4	6	12	22	12	18
P_4	0	8	0	8	0	8
P_5	3	1	5	9	5	6
Avg =			6.8	13.2	6.8	11.2

SJTF (Preemptive)

যে process এসেছে সেই process arrive করলে running process pause হয়ে যাবে & check করবে এ A.T এর মধ্যে যার B.T. কম, সেই B.T. কম হলে সেটা run করবে তবে একাধিক process এ B.T. same হলে যে আগে arrive করবে সে run হবে।

(1)

P4	P2	P2	P5	P1	P3	P4
0	1	2	3	4	9	15	22

PID	A.T.	B.T.	R.T.	C.T.	W.T.	T.T.
P_1	2	5,0	2	9	2	7
P_2	1	2,1,0	0	3	0	2
P_3	4	6,0	5	15	5	11
P_4	0	8,7,0	0	22	14	22
P_5	3	1,0	0	4	0	1
		Avg =	1.4	10.6	4.2	8.6

(2)

P5	P1	P2	P3	P5	P4
0	2	5	6	8	13	18

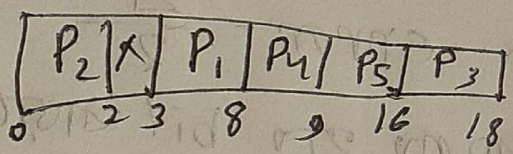
P.ID.	A.T.	B.T.	R.T.	C.T.	W.T.	T.T.
P_1	2	3,0	0	5	0	3
P_2	5	1,0	0	6	0	1
P_3	6	2,0	0	8	0	2
P_4	8	5,0	5	18	5	10
P_5	0	3,5,0	0	13	6	13
		Avg =	1	10	2.2	5.8

12/2/22

OS (T-8)

Priority Scheduling :-

PID	AT	BT.	Priority	R.T.	C.T.	W.T.	T.T.
P_1	3	5	8	0	8	0	5
P_2	0	2	6	0	2	0	2
P_3	5	2	1	11	18	11	13
P_4	7	1	5	1	9	1	2
P_5	8	7	2	1	16	1	8



OS (T-9) 15/2/23

Priority Scheduling :- (Preemptive)

PID	A.T.	B.T.	Priority	R.T.	C.T.	W.T.	T.T.
P_1	0	2	12	16	18	16	18
P_2	1	4,3	4	0	6	1	5
P_3	0	6,5	10	0	16	10	16
P_4	2	1	(3) → Highest Priority	0	3	0	1
P_5	3	5	6	3	11	3	8
			Avg →	3.8	10.8	6	9.6

Gantt chart:

P_3	P_2	P_4	P_2	P_5	P_3	P_1
0–1	1–2	2–3	3–6	6–11	11–16	16–18

→ queue maintain करना है & time quanta है process duration for each process unless B.T is less than T.Q.

Round Robin :- Time quanta : 2 (Preemptive) → Just

Gantt chart:

P_1	P_5	P_1	P_2	P_4	P_1	P_2	P_3	P_4	P_1	P_2	P_3	P_1
0–2	2–3	3–5	5–7	7–9	9–11	11–13	13–15	15–16	16–18	18–20	20–22	22–24

PID	A.T.	B.T.	R.T.	C.T.	W.T.	T.T.
P_1	0	10,8,6,4,2,0	0	24	14	24
P_2	3	6,4,2,0	2	20	11	17
P_3	8	4,2,0	5	22	10	14
P_4	5	3,1,0	2	16	8	11
P_5	1	1,0	1	3	1	2
		Avg →	2	17	8.8	13.6

Queue :- P_1, P_5, P_1, P_2, P_4, P_1, P_2, P_3, P_4, P_1, P_2, P_3, P_1